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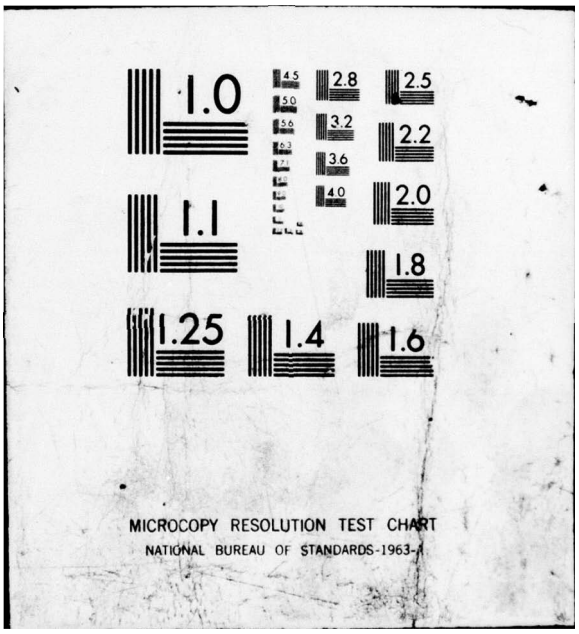
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RESEARCH ON DETECTION OF PULSED RADIATION AT 10.6 MICRONS

FINAL REPORT

O. L. GADDY

DECEMBER 1977

U. S. ARMY RESEARCH OFFICE

GRANT NO. DAHC04-75-G0123

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UNIVERSITY OF ILLINOIS AT URBANA CHAMPAIGN
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The results of research on fast response time infrared detectors are described. This research resulted in the development of thin film bolometer detectors capable of operation at room temperature with nanosecond response time.

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TABLE OF CONTENTS

I. INTRODUCTION

This report summarizes the research activities and accomplishments under Grant No. DAHCO4-75-GO123. The research performed on the grant was a continuation of the work supported by Grant No. DA-ARO-D-31-124-73-G117. During the period of this grant, research has continued on techniques and devices for room temperature detection of fast pulsed radiation at wavelengths near 10.6 μm. In addition, initial work was performed on position sensing bolometric detectors. A summary of the work performed is presented below.

II. RESEARCH RESULTS

During the periods of the above-mentioned grants, work was completed on the investigation of nanosecond response time, thin-film, metal bolometers. Devices were constructed and tested that showed equipment limited rise times of 2 nanoseconds and theoretically predicted resistance of less than 1 nanosecond.

Work was also performed on the construction of fast pulsed CO_2 lasers for evaluating the performance of the detection being studied. This involved electro-optic modulated Q-switched CO_2 lasers as well as the discovery of self-pulsing gain switched waveguide CO_2 lasers.

During the latter part of this period, most of the research was concentrated on the investigation of the film semiconductor IR bolometers as well as temperature sensitive semiconductor p-n junction devices. This research demonstrated that detectors of this type could be constructed which had sensitivity greater than one could achieve with thin film metal bolometers with a sacrifice in device response time.

Also during the latter part of this period, initial work was performed on position sensing IR bolometer detectors. It has been demonstrated that

position sensing detectors using thin metal film bolometers of various configurations are potentially very useful devices possessing a high degree of linearity.

The details of the results of this research have been reported in articles published, or submitted for publication to scientific journals and in graduate theses. A list of these publications is shown in Section V of this report.

III. PERSONNEL

The research described above has been performed by several graduate students under the direction of the principal investigator, O. L. Gaddy. These include W. H. Black, J. C. Zimmerman, S. W. Merritt and J. P. Krys. All of these students had outside sources of support and salaries were not provided by this grant.

IV. SUPPLEMENTAL FUNDING

Considerable supplemental financial support for the purchase of equipment and supplies used in this research has been provided by the Industrial Affiliates Program in Physical Electronics at the University of Illinois.

V. PUBLICATIONS AND GRADUATE THESES

Publications

W. H. Block and O. L. Gaddy, "Improved Responsivity and Sensitivity Characteristics of the Thin-Film Bismuth Bolometer," IEEE Journal of Quantum Electronics, Vol. QE-9, No. 2, pp. 252-254, February 1973.

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Ph.D. Theses

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J. C. Zimmerman, "Thin Film Semiconductor Detectors for 10.6 μm Radiation," 1976.

M.S. Thesis

J. Krys, III, "Characterization of Thin Bismuth Film Position Sensing Bolometer," 1977.